

**Notice of Allowability****Application No.**

10/596,750

**Examiner**

MICHAEL J. FEELY

**Applicant(s)**

HOA ET AL

**Art Unit**

1761

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--**

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to the RCE filed 12/14/2011.
2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on \_\_\_\_; the restriction requirement and election have been incorporated into this action.
3. ☒ The allowed claim(s) is/are 1,3-13,20,21,23,24,26,27 and 33-37.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some\* c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\* Certified copies not received: \_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.  
**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT OR NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
6. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
- (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
- 1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_.
- (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.21(d).
7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

**Attachment(s)**

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO/SB/08),  
Paper No./Mail Date \_\_\_\_
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☒ Interview Summary (PTO-413),  
Paper No./Mail Date 20120312.
7. ☒ Examiner's Amendment/Comment
8. ☐ Examiner's Statement of Reasons for Allowance
9. ☒ Other Detailed Allowance

/MICHAEL J FEELY/  
Primary Examiner, Art Unit 1761

### EXAMINER'S AMENDMENT

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Michael P. Byrne (Reg. No. 54,015) on March 12, 2012.

The application has been amended as follows:

*In the claims:*

1. (Currently Amended) A method for making a modified epoxy, comprising the steps of:

a) preparing a clay solution comprising solvents, clay particles of a dimension in the nanometer range and agglomerates of clay particles;

b) generating a flow of clay solution and submitting said flow to: (1) high pressure to generate high velocity and to allow shearing in the clay solution to occur; (2) a region of obstacles allowing the agglomerates of clay particles to be broken down; and (3) a sudden lower pressure, yielding a dispersed clay solution having a fine and homogeneous distribution of clay particles of a dimension in the nanometer range in the clay solution; and

c) mixing the dispersed clay solution with at least a pristine epoxy, wherein a rubber material is optionally provided with the pristine epoxy during mixing.

2. (Cancelled)

3. (Currently Amended) The method according to claim 1, wherein said step a) comprises incorporating a first part of the pristine epoxy into the clay solution; and said step c) comprises mixing the dispersed clay solution with a remaining part of the pristine epoxy.
4. (Original) The method according to claim 1, wherein said step a) comprises mixing with at least one of mechanical and ultrasonic mixing.
5. (Original) The method according to claim 1, wherein said step b) comprises submitting the clay solution to a pressure of about 20,000 psi in tubes of a diameter of about 0.1 mm.
6. (Original) The method according to claim 1, wherein said step b) comprises exfoliating the clay particles in the solution.
7. (Previously Presented) The method according to claim 1, wherein said step c) comprises adding curing agents to yield a solid epoxy material.
8. (Currently Amended) The method according to claim 1, whereby the modified epoxy comprises agglomerates of less than about 1  $\mu\text{m}$  and agglomerates of a maximum diameter between about 1  $\mu\text{m}$  and 2  $\mu\text{m}$ .

9. (Previously Presented) The method according to claim 1, whereby the modified epoxy has enhanced viscoelastic properties and improved fracture toughness compared to the pristine epoxy.

10. (Currently Amended) The method according to claim 9, wherein a content of about 1 wt% of clay loading and no optional rubber yields an increase in critical stress intensity ( $K_{IC}$ ) and critical strain energy release rate ( $G_{IC}$ ) of 2 and 3 times respectively, with respect to the pristine epoxy.

11. (Original) The method according to claim 1, whereby the modified epoxy has enhanced barrier properties, including water absorption resistance, adhesion strength and flammability resistance, with respect to the pristine epoxy.

12. (Original) The method according to claim 1, wherein a mixture of clay and epoxy obtained has a stability over an extended period of time.

13. (Original) The method according to claim 1, wherein the optional rubber is provided with the pristine epoxy during mixing.

14 - 19. (Cancelled)

20. (Currently Amended) A modified epoxy produced from a pristine epoxy, the modified epoxy having at least higher barrier properties and thermal resistance, a higher critical stress intensity

factor ( $K_{IC}$ ), and a higher critical strain energy release rate ( $G_{IC}$ ) than the pristine epoxy, the modified epoxy produced by:

a) preparing a clay solution comprising solvents, clay particles of a dimension in the nanometer range and agglomerates of clay particles;

b) generating a flow of clay solution and submitting said flow to: (1) high pressure; (2) high velocity and breaking impacts in a region of obstacles to allow the agglomerates to be broken down; and (3) a sudden lower pressure, yielding a dispersed clay solution having a fine and homogeneous distribution of clay particles of a dimension in the nanometer range in the clay solution; and

c) mixing the dispersed clay solution with at least part of the pristine epoxy, wherein a rubber material is optionally provided with the pristine epoxy during mixing;

wherein a content of about 1wt% of clay loading and no optional rubber yields an increase in  $K_{IC}$  and  $G_{IC}$  of 2 and 3 times respectively, with respect to the pristine epoxy.

21. (Original) The modified epoxy according to claim 20, comprising finely dispersed clay agglomerates of less than about 1  $\mu\text{m}$  and agglomerates of a maximum diameter between about 1  $\mu\text{m}$  and 2  $\mu\text{m}$ .

22. (Cancelled)

23. (Previously Presented) The modified epoxy according to claim 21, wherein the optional rubber is provided with the pristine epoxy during mixing.

24. (Original) The modified epoxy according to claim 21, further comprising additives.

25. (Cancelled)

26. (Currently Amended) The modified epoxy according to claim 23, wherein the optional rubber is CTBN, and a content of 6 phr of clay loading and 20 phr of CTBN yields an increase in  $K_{IC}$  and  $G_{IC}$  of 2.2 and 7.6 times respectively, with respect to the pristine epoxy.

27. (Currently Amended) The method according to claim 13, wherein the optional rubber is CTBN, and a content of 6 phr of clay loading and 20 phr of CTBN yields an increase in critical stress intensity factor ( $K_{IC}$ ) and critical strain energy release rate ( $G_{IC}$ ) of 2.2 and 7.6 times respectively, with respect to the pristine epoxy.

28 - 32. (Cancelled)

33. (Currently Amended) A modified epoxy produced from a pristine epoxy, the modified epoxy having at least a higher flammability resistance and a higher fracture toughness than the pristine epoxy, the modified epoxy produced by:

a) preparing a clay solution comprising solvents, clay particles of a dimension in the nanometer range and agglomerates of clay particles;

b) generating a flow of clay solution and submitting said flow to: (1) high pressure; (2) high velocity and breaking impacts in a region of obstacles to allow the agglomerates to be broken down; and (3) a sudden lower pressure, yielding a dispersed clay solution having a fine and homogeneous distribution of clay particles of a dimension in the nanometer range in the clay solution; and

c) mixing the dispersed clay solution with at least part of the pristine epoxy;  
wherein a content of 6 phr of clay loading yields an increase in critical strain energy release rate ( $G_{IC}$ ) of 5.8 times, with respect to the pristine epoxy.

34. (Currently Amended) The modified epoxy of claim 33, wherein said step c) comprises adding curing agents to yield a solid epoxy material.

35. (Currently Amended) A modified epoxy produced from a rubber-modified pristine epoxy, the modified epoxy having at least a higher flammability resistance and a higher fracture toughness than the rubber-modified pristine epoxy, the modified epoxy produced by:

a) preparing a clay solution comprising solvents, clay particles of a dimension in the nanometer range and agglomerates of clay particles;

b) generating a flow of clay solution and submitting said flow to: (1) high pressure; (2) high velocity and breaking impacts in a region of obstacles to allow the agglomerates to be broken down; and (3) a sudden lower pressure, yielding a dispersed clay solution having a fine and homogeneous distribution of clay particles of a dimension in the nanometer range in the clay solution; and

c) mixing the dispersed clay solution with at least part of the rubber-modified pristine epoxy;

wherein the rubber of the rubber-modified pristine epoxy is CTBN, and a content of 6 phr of clay loading and 20 phr of CTBN yields an increase in critical strain energy release rate ( $G_{IC}$ ) of 7.6 times, with respect to the pristine epoxy.

36. (Previously Presented) The modified epoxy of claim 35, wherein said step c) comprises adding curing agents to yield a solid epoxy material.

37. (Previously Presented) The modified epoxy of claim 20, wherein said step c) comprises adding curing agents to yield a solid epoxy material.



**DETAILED ALLOWANCE**

***Pending Claims***

Claims 1, 3-13, 20, 21, 23, 24, 26, 27, and 33-37 are pending.

***Continued Examination Under 37 CFR 1.114***

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on December 14, 2011 has been entered.

***Election/Restrictions***

2. Previously submitted claims 28-32 (Group II) were directed to an invention that was independent or distinct from the invention originally claimed. Since applicant received an action on the merits for the originally presented invention, this invention was constructively elected by original presentation for prosecution on the merits. Accordingly, claims 28-32 were withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03. Claims 28-32 are now cancelled.

***Response to Amendment***

3. The rejection of claims 20, 21, and 24 under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Chen et al. (XP008051803) has been overcome by amendment.
4. The rejection of claim 23 under 35 U.S.C. 103(a) as being unpatentable over Chen et al. (XP008051803) in view of Furihata (US Pat. No. 4,465,542) has been overcome by amendment.

***Allowable Subject Matter***

5. Claims 1, 3-13, 20, 21, 23, 24, 26, 27, and 33-37 are allowed.

*Communication*

Any inquiry concerning this communication or earlier communications from the examiner should be directed to MICHAEL J. FEELY whose telephone number is (571)272-1086. The examiner can normally be reached on M-F 8:30 to 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Harold Y. Pyon can be reached on 571-272-1498. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/MICHAEL J FEELY/  
Primary Examiner, Art Unit 1761

March 14, 2012